

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

James A. Hutchison IV

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For: **ARBITRATED AUDIO COMMUNICATION
WITH REDUCED LATENCY**

Art Unit: 2684

Examiner: Angelica Perez

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AMENDED SUMMARY OF CLAIMED SUBJECT MATTER

In accordance with 37 CFR § 41.37c(1)(v), Appellant provides a brief summary of each independent claim involved in the appeal, where the summary refers to the specification by page and line number and to the drawings by reference number. Appellant notes that the specification citations in this section are provided to identify some portions of the specification related to the particular claims. In the interest of brevity, the summary does not necessarily include all references to all relevant portions of the specification and drawings. Accordingly, omission of any reference to the specification or to the drawings should not be construed in any way as an intent to relinquish claim scope, or as an implication or statement regarding the conformance with 35 U.S.C. § 112. Appellant respectfully submits that the claims should not be construed as being limited to the embodiments cited in this section, and further submits that other embodiments, as well as the Doctrine of Equivalents, may apply in determining claim scope.

In general, all pending claims relate to audio communication in a point-to-multipoint communication system.¹ In a point-to-multipoint communication system, a user can broadcast audio messages to one or more recipients over a communications channel referred to as a broadcast link. Typically, only one user at a time may send audio to other users on the broadcast

¹ Applicant's Spec. at Paragraphs [0002] and [0019].

link.² To permit communication among multiple users, a point-to-multipoint communication system arbitrates user access to the broadcast link so as to restrict its access to only one broadcaster at a time.³

An example of a point-to-multipoint communication system is a push-to-talk (PTT) system in which users communicate with one another as a group using wireless and/or wired communication devices.⁴ Typically, a PTT system relies on a shared communication link, also called a broadcast link or multi-cast link, over which audio communications are received simultaneously by multiple communication devices.⁵ As mentioned above, only one user can transmit information to other users at any given time.⁶ However, all users who participate in the point-to-multiple communication can simultaneously listen to the speaker via the broadcast link.⁷

² *Id* at [0002].

³ *Id.*

⁴ *Id.*

⁵ *Id.*

⁶ *Id.*

⁷ *Id.*

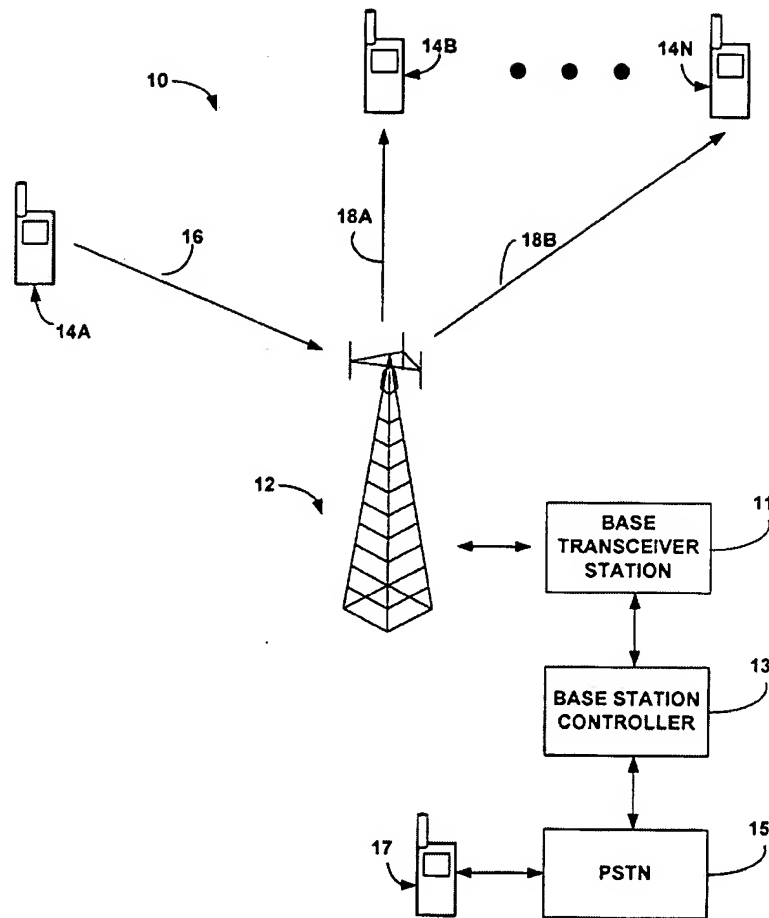
**FIG. 1**

FIG. 1 of Appellant's disclosure, which is reproduced above, depicts an example point-to-multipoint communication system. As shown in FIG. 1, a wireless base station 12 permits a number of wireless communication devices 14A-14N (hereinafter 14) to communicate with one another and with other devices on networks connected to system 10.⁸ As shown in FIG. 1, using wireless communication device 14A, a participant may send an outgoing communication 16.⁹

Users associated with wireless communication devices 14B-14N receive the communication sent by wireless communication device 14A as incoming communications 18A, 18B, respectively.¹⁰ Base station 12 may include a base transceiver station (BTS) 11 that interacts with a base station controller (BSC) 13 and public switched telephone network (PSTN)

⁸ See also Applicant's Spec. at [0025].

⁹ *Id.*

¹⁰ *Id.*

15 to facilitate communications with one or more wired telephones 17 or other wired telephony devices, e.g., computer telephony systems.¹¹

In a point-to-multipoint communication system, a user who desires to communicate with the other users may press a talk button on a communication device.¹² In response, the communication device transmits a request for access to an arbitration controller.¹³ An arbitration controller, which may be integrated with wireless network equipment or a wireless device in the system, limits access to the broadcast link to only one participant at a given time.¹⁴ The arbitration controller processes the request and replies with an indication that access is either granted or denied.¹⁵

If access is granted, the requesting user has sole access to the broadcast link for transmission of audio communications to the other users.¹⁶ In this case, the requesting user may begin to speak, and the communication device begins to transmit the audio communication.¹⁷ When more than one user desires to speak, the arbitration controller arbitrates access to the broadcast link among the participants.¹⁸ In a conventional system, if access is denied, the communication device operated by the requesting user is unable to transmit the audio communication.

In known point-to-multipoint systems, a three-step process is used to gain access to a broadcast link: 1) a user sends an access request to an arbitration controller, 2) the user then waits for grant of the access request from an arbitration controller, and 3) the user finally sends audio over a link only after the access request is granted.¹⁹

In sharp contrast to known point-to-multipoint systems, the claimed invention eliminates the need for step 2 in the above three-step process. The claimed invention relates to arbitration techniques that accelerate access to the broadcast link, thereby reducing system latency. Latency, i.e., a delay in the start of communication by a participant, can be disconcerting to

¹¹ Applicant's Spec. at [0028].

¹² Applicant's Spec. at [0003].

¹³ *Id.*

¹⁴ *Id.*

¹⁵ *Id.*

¹⁶ *Id.*

¹⁷ *Id.*

¹⁸ *Id.*

¹⁹ Applicant's Spec. at [0002].

participants attempting to conduct a conversation.²⁰ When there is a delay in obtaining link access, the resulting latency can introduce awkward pauses during the course of a conversation carried out over a point-to-multipoint system.²¹

To obtain access to the broadcast link, in accordance with the claimed invention, a user transmits both a request for access and audio representing a desired audio communication to an arbitration controller.²² In sharp contrast to known systems, audio is transmitted before receiving a grant or denied acknowledgement from the access controller.²³ The wireless communication device can transmit the audio with the access request.

If the access request is denied, the audio may be discarded.²⁴ In most instances of typical polite conversation, however, the request will be granted.²⁵ As a result, the audio can be transmitted immediately to the other users, significantly reducing latency in the system.²⁶ In particular, by the time the access request has been granted, the audio has already been transmitted to equipment within the network, such as an arbitration controller.

Upon grant of the access request, the equipment directs transmission of the audio that has already been received, rather than waiting to receive the audio after transmission of a grant acknowledgement. Transmission of the audio may immediately follow the access request.²⁷ In some embodiments, the audio itself may serve as the access request for an arbitration controller, eliminating the need for a separate request to be communicated.²⁸

As a further alternative, detection of the audio by the speaker's wireless communication device may trigger transmission of an access request and the audio to the arbitration controller.²⁹ In either case, by transmitting the audio with the access request, excessive delay can be eliminated between the transmission of the access request and the transmission of the audio.³⁰ Again, it is not necessary to wait for an acknowledgement that the access request has been granted or denied before transmitting the audio communication.

²⁰ *Id.* at [0021] and [0044].

²¹ *Id.* at [0021] and [0024].

²² *Id.* at [0019].

²³ *Id.* at [0019] and [0023].

²⁴ *Id.* at [0021], [0032] and [0037].

²⁵ *Id.* at [0021].

²⁶ *Id.* at [0021], [0023] and [0030].

²⁷ *Id.* at [0022], [0030] and [0035].

²⁸ Applicant's Spec. at [0022].

²⁹ Applicant's Spec. at [0023].

³⁰ *Id.*

By reducing audio latency, a system and method as described by Appellant's disclosure, and set forth in the pending claims, can promote enhanced quality of service among participants in a point-to-multipoint communication system.³¹ In particular, users can conduct conversations more readily without suffering the awkwardness of extended delays and pauses between audio received from different speakers.³² Arbitration can be performed within wireless communication devices or in wireless network equipment, such as a mobile base station equipment, enabling flexible implementation of arbitration schemes.³³

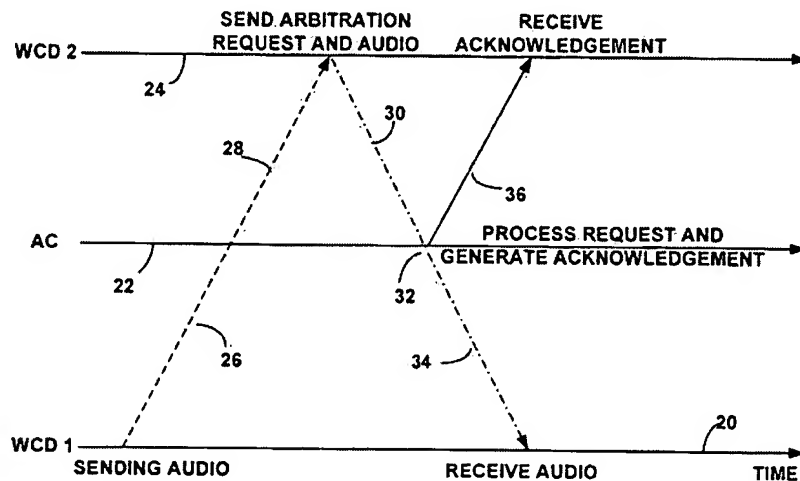


FIG. 2

FIG. 2 of Appellant's disclosure illustrates an example of accelerated arbitration, in accordance with an embodiment of the claimed invention, and is reproduced above.³⁴ FIG. 2 illustrates arbitration by base station 12 in response to a request for access to the broadcast link by a wireless communication device 14. In FIG. 2, line 20 indicates the perspective of a first wireless communication device (WCD 1), line 22 indicates the perspective of an arbitration controller (AC), and line 24 indicates the perspective of a second wireless communication device (WCD 2). Each of lines 20, 22, 24 represents the elapse of time from left to right as arbitration and communication take place within system 10. In FIG. 2, the arbitration controller is implemented in the network. In other embodiments, as shown in FIG. 4, the arbitration controller may be implemented elsewhere, such as within a wireless communication device.

³¹ Applicant's Spec. at [0024].

³² *Id.*

³³ *Id.*

³⁴ See also Applicant's Spec. at [0033].

Initially, in the example of FIG. 2, WCD 1 has broadcast priority and is sending an audio communication 26 pursuant to a previous arbitration.³⁵ The arbitration controller directs the audio over the broadcast link to one or more wireless communication devices, including WCD 2 28. When WCD 2 desires access to the broadcast link, it sends not only an access request 30, but also the audio communication 30 ("SEND ARBITRATION REQUEST AND AUDIO").³⁶ The request and audio may be sent simultaneously or in rapid succession.³⁷ In either case, WCD 14 does not wait for an acknowledgement from the arbitration controller (AC) to send the audio.³⁸

In the example of FIG. 2, the arbitration controller processes the request (32) and generates an acknowledgement.³⁹ If the request is granted, the arbitration controller directs the audio from WCD 2 over the broadcast link to other users, including WCD 1 (34).⁴⁰ In addition, the arbitration controller may send an acknowledgement that the request has been granted to WCD 2 (36).⁴¹ Upon receipt of the acknowledgement that the request has been granted, the participant associated with WCD 2 may receive a notification that the access request was successful.⁴²

Consequently, the participant can be certain that the previous audio communication was successfully transmitted over the broadcast link, and may continue with transmission of the remainder of the audio communication.⁴³ However, there is no need to wait for grant of the access request in order to send the audio. Instead, upon grant, the audio that has already been transmitted to the arbitration controller, or other network equipment, is transmitted to other WCDs in the system, such as WCD 1.

In the event the access request is not granted, the arbitration controller sends an unfavorable acknowledgement to WCD 2, and the arbitration controller does not direct the audio from WCD 2 over the broadcast link to other users.⁴⁴ In this case, the audio transmission received from WCD 2 may simply be discarded.⁴⁵ The arbitration controller directs the

³⁵ Applicant's Spec. at [0034].

³⁶ *Id.*

³⁷ *Id.*

³⁸ *Id.*

³⁹ *Id.*

⁴⁰ Applicant's Spec. at [0035].

⁴¹ *Id.*

⁴² *Id.*

⁴³ Applicant's Spec. at [0035].

⁴⁴ Applicant's Spec. at [0037].

⁴⁵ *Id.*

appropriate network equipment to allocate the broadcast link to another user or leave the broadcast link allocated to an existing user.⁴⁶ The audio may be temporarily buffered by the network equipment, e.g., base station 12, while the arbitration of the access request is processed.⁴⁷ Upon denial of the access request, the arbitration controller may direct that the buffered audio simply be purged.⁴⁸

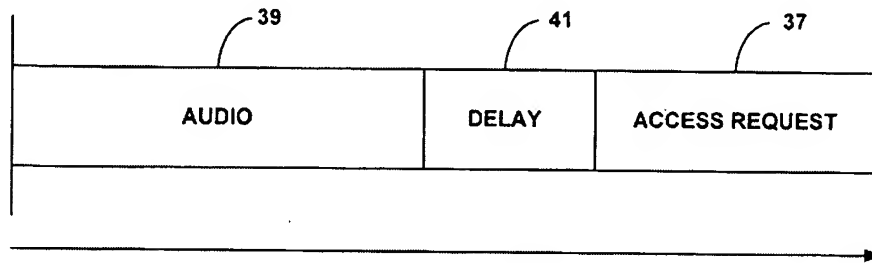


FIG. 3

With reference to FIG. 3 of Appellant's disclosure, reproduced above, a wireless communication device 14 transmits an access request 37 to base station 12 when access to the broadcast link is desired.⁴⁹ Access request 37 is accompanied by all or part of an audio communication 39 made by the user of the wireless communication device 14.⁵⁰ Hence, wireless communication device 14 transmits the audio with the access request.

As noted in Appellant's disclosure, the audio may follow immediately after the access request 37 or be separated by a slight time delay 41.⁵¹ In addition, in some embodiments, the audio communication itself may serve as the access request.⁵² For example, an arbitration controller may interpret the audio as an access request. In either case, wireless communication device 14 transmits the audio with the access request, and without the delay involved in waiting for an acknowledgement that the access request has been granted.⁵³ Upon receipt of an

⁴⁶ *Id.*

⁴⁷ Applicant's Spec. at [0031].

⁴⁸ Applicant's Spec. at [0037].

⁴⁹ See also Applicant's Spec. at [0045].

⁵⁰ *Id.*

⁵¹ *Id.*

⁵² *Id.*

⁵³ *Id.*

unfavorable acknowledgement, i.e., that the access request is denied, the audio transmission is terminated.

An example of the method recited in independent claim 1 is described in the specification at page 14, paragraphs [0055] – [0056]. Claim 1 defines a method comprising transmitting a request for access (FIG. 7 at 84), to a broadcast link in a point-to-multipoint communication system (FIG. 1 at 10), transmitting audio with the access request (FIG. 7 at 86), and terminating the audio transmission in the event the access request is denied (FIG. 7 at 96). Claims 2-11 are dependent on claim 1.

An example of the method recited in independent claim 12 is described in the specification at page 15, paragraph [0057]. Claim 12 defines a method comprising receiving a request for access (FIG. 8 at 98) to a broadcast link in a point-to-multipoint communication system (FIG. 1 at 10), receiving audio before transmission of an indication that the access request is granted and before transmission of an indication that the access request is denied (FIG. 8 at 100), wherein the audio includes speech, and transmitting the audio via the broadcast link in the event the access request is granted (FIG. 8 at 106). Claims 13-19 are dependent on claim 12.

An example of the wireless communication device recited in independent claim 20 is described in the specification at page 12, paragraph [0050] – page 13, paragraph [0052]. Claim 20 recites a wireless communication device (FIGS. 1 & 5 at 14) comprising a wireless transmitter (FIG. 5 at 62), and a processor (FIG. 5 at 48) that controls the transmitter to transmit a request for access to a broadcast link in a point-to-multipoint communication system (FIG. 1 at 10), transmit audio with the access request, and terminate the audio transmission in the event the access request is denied. Claims 21-25 are dependent on claim 20.

An example of the arbitration controller recited in independent claim 26 is described in the specification at page 14, paragraphs [0053] – [0054]. Claim 26 specifies an arbitration controller for a point-to-multipoint communication system (FIG. 1 at 10). The arbitration controller comprises a processor (FIG. 6 at 76) that receives a request for access to a broadcast link from a wireless communication device (FIGS. 1 & 5 at 14) in a point-to-multipoint communication system (FIG. 1 at 10). The processor receives audio from the wireless communication device before transmission of an indication that the access request is granted and before transmission of an indication that the access request is denied. The processor determines whether to grant the access request, and directs transmission of the audio via the broadcast link

in the event the access request is granted, wherein the audio includes speech. Claims 27-32 are dependent on claim 26.

An example of the computer-readable medium recited in independent claim 33 is described in the specification at page 17, paragraphs [0064] – [0065] and at page 14, paragraphs [0055] – [0056]. Claim 33 recites a computer-readable medium carrying instructions to cause a processor (FIG. 5 at 48) in a wireless communication device (FIGS. 1 & 5 at 14) in a point-to-multipoint communication system (FIG. 1 at 10) to perform a method substantially as set forth in claim 1.

An example of the computer-readable medium recited in independent claim 34 is described in the specification at page 17, paragraphs [0064] – [0065] and at page 15, paragraph [0057]. Claim 34 recites a computer-readable medium carrying instructions that cause a processor (FIG. 6 at 76) in network equipment (FIG. 6 at 12) in a point-to-multipoint communication system (FIG. 1 at 10) to perform a method substantially as set forth in claim 12.

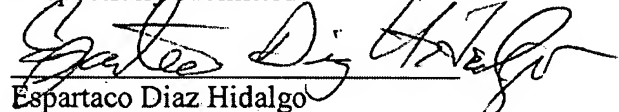
An example of the method recited in independent claim 35 is described in the specification at page 14, paragraphs [0055] – [0056]. Claim 35 recites a method comprising transmitting a request for access (FIG. 7 at 84) to a broadcast link in a point-to-multipoint communication system (FIG. 1 at 10) from a wireless communication device (FIGS. 1 & 5 at 14), receiving audio from a user of the wireless communication device, transmitting the audio from the wireless communication device before receiving an acknowledgement that the access request is granted and before receiving an acknowledgement that the access request is denied (FIG. 7 at 86), and terminating the audio transmission if a denial of the access request is received (FIG. 7 at 96). Claim 36 is dependent on claim 35.

An example of the method recited in independent claim 37 is described in the specification at page 14, paragraphs [0055] – [0056]. Claim 37 recites a method comprising transmitting a request for access (FIG. 7 at 84) to a broadcast link in a point-to-multipoint communication network (FIG. 1 at 10) from a wireless communication device (FIGS. 1 & 5 at 14) to network equipment (FIGS. 1 & 6 at 12), receiving audio from a user of the wireless communication device, transmitting the audio from the wireless communication device to the network equipment before the access request is granted and before the access request is denied (FIG. 7 at 86), and terminating the audio transmission (FIG. 7 at 96) and discarding the transmitted audio (FIG. 8 at 110) if the access request is denied, wherein the audio includes speech.

An example of the method recited in independent claim 38 is described in the specification at page 14, paragraphs [0055] – [0056]. Claim 38 recites a method comprising transmitting an access request (FIG. 7 at 84) from a wireless communication device (FIGS. 1 & 5 at 14) to network equipment (FIGS. 1 & 6 at 12), the access request including a request for access to a broadcast link in a point-to-multipoint communication system (FIG. 1 at 10), receiving speech from a user of the wireless communication device, transmitting the speech from the wireless communication device to the network equipment before the wireless communication device receives an acknowledgement from the network equipment that the access request is granted and before the wireless communication device receives an acknowledgement from the network equipment that the access request is denied (FIG. 7 at 86), and terminating the speech transmission from the wireless communication device to the network equipment in the event the access request is denied (FIG. 7 at 96).

An example of the method recited in independent claim 39 is described in the specification at page 14, paragraphs [0055] – [0056]. Claim 39 recites a method comprising transmitting a request for access (FIG. 7 at 84) to a broadcast link in a point-to-multipoint communication system (FIG. 1 at 10), transmitting audio from a wireless communication device (FIGS. 1 & 5 at 14) before receiving an acknowledgement that the access request is granted and before receiving an acknowledgement that the access request is denied (FIG. 7 at 86), wherein the audio includes speech, and terminating the audio transmission in the event the access request is denied (FIG. 7 at 96).

Respectfully submitted



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